DETAILED ACTION

1.   Claims1-53 are pending in this application.

Priority

2.   Acknowledgment is made of applicant's claim for foreign priority based on an application no. 1014/CHE/2003 filed in India on 12/15/2003. The certified copy has been filed in parent application 10539646, filed 10/03/2006.

Drawings

3.   The drawings filed on 06/15/2005 are accepted for examination.

Response to Amendment

4.   Applicant's response to the last Office Action filed in 12/28/2009 has been entered and made of record.

5.   Claims 1 is amended in order to overcome 35 USC § 101 rejection.

6.   In view of the Applicant's amendments, the claims rejections (claims 1-19) under 35 USC§101 are expressly withdrawn.

Response to Arguments

7.   Applicant's response to the last Office Action, filed on 12/28/2009 has been entered and made of record.

8.   Applicant's arguments with respect to claims 1, 20 and 26 have been fully considered,

but they are not persuasive. See discussion below.

a)   At page 11 lines 29-30 and page 12 lines 1-5, claim 1, the applicant argues that

the combination of Anastassiou and Malvar is improper. Specifically the applicant argues "as the

bit planes of Anastassiou store pixel values, whereas Malvar does not use <u>data-dependent data

structures</u> (Malvar, col. 3, line 15). One of skilled in the art with the knowledge of Anastassiou

will not look to Malvar for knowledge of how to compress images using the process as proposed

by the Examiner because the way encoding is done in Anastassiou is different from that of

Malvar. Combining Anastassiou with Malvar would result in Malvar using <u>pixel values which is a

data-dependent data structure.</u>"

      As to the above argument [a], examiner respectfully disagrees with the applicants

because of the following reasons:

      i) the applicant fail to indicate the section(s) in Anastassiou patent that teach or suggest

the data compression method for graphic image of Anastassiou use only data<u>-dependent data

structures in order to compress graphic images.</u>

      ii). In Anastassiou patent, the examiner couldn't fined a statement that teaches or

suggestions (explicitly or inherently) <u>using pixel values which data dependent data structures</u> in

order to compress the graphic images.

      iii) In col. 3, lines 14-15, Malvar state "the present invention does not use zerotress or

other data-dependent data structures. The examiner couldn't find in Anastassiou patent that

teaches or suggests the invention of Anastassiou uses the zerotress or the other data-

dependent data structures.

Therefore, as best understood by examiner the combination of Anastassiou with Malvar is appropriate. Since both Anastassiou and Malvar are directed to image compression method.

b)   At page 12 lines 13-18, claim 1, the applicant argue "applicant is claiming a bit plane with two values, not two bit planes as disclosed by Anastassiou. Because Anastassiou discloses two bit planes and not a bit plane with two values, applicant respectfully submits that Anastassiou does not disclose "transforming the image data into a bit plane of first and second values" as claimed in claim 1."

As to the above argument [b], examiner respectfully disagrees with the applicants because even Anastassiou disclosed two bit planes, one of the two bit planes of Anastassiou corresponds to the bit plane disclosed by applicant. Specifically Anastassiou disclosed two bit planes, and each bit plane has two values. For example the table in col. 4 lines 31-35 shows that the first bit plane with two bit values 0 and 1, wherein the bit values "0" and "1" are obtained by transforming the graphing image into bits. Therefore, Anastassiou teaches bit plane with two bit values "0" and "1" that corresponds to the bit plane disclosed by applicant. The first and second values correspond to "0" and "1".

c)   At page 12 lines 18-20, claim 1, the applicant argues "Malvar discloses multiple bit planes and not a bit plane with a first and second value, applicant respectfully submits that Malvar does not disclose this claimed element."

As to the above argument [c], examiner respectfully disagrees with the applicants, even Malvar discloses multiple bit planes, and each of the multiple bit planes continues "0" and "1" bits as bit values.

d)   At page 12 lines 20-25, claim 1, the applicant argue "Even if the references are combinable, the combination lacks the element claimed by the applicants. As per above, applicants respectfully submit that the combination of Anastassiou and Malvar does not disclose "transforming the image data into a bit plane of first and second values."

As to the above argument [d], examiner respectfully disagrees with the applicant, because as discussed above, for example in col.4 lines 31-35 Anastassiou disclosed the first bit plane with two bit values "0" and "1" and the bit values "0" and "1" are obtained by transforming the graphing image. The first and second value corresponds to "0" and "1"

e)   At page 14 lines 1-5, claim 26, the applicant argue "the Examiner asserts that it is obvious to incorporate the arithmetic coding technique of Funnell into Malvar, because that would have allowed user of Malvar to recompress previously compressed data (convert back to the original format) with little or loss. Recompressing data actually generates a data stream that is more compressed than the original compressed date (Funnell [0026]). Thus combining Malvar with Funnell would compress the data further and not have their data return to the original format after decompression. Therefore, the principle of operation of Malvar would change and applicant respectfully submits that the combination is improper"

As the above argument (e) the examiner has made a typo error by typing "recompress" instead of "decompress" in the motivation statement. The examiner regrets for the inconvenience this typo error that may cause. Apart from this typo error the examiner respectfully disagrees with the applicant, because Funnell teaches lossless compression process ([0060],[0048]) with an entropy decompression unit 410 coupled with an entropy compression unit 415(Fig.4). The decompressed data is identical to the original data since the compression process is lossless. Thus, because of lossless compression, the process of decompress previously compressed data convert back the decompressed data to the original format with little or loss.

f)   At page 14 lines 11-16, claim 26, the applicant argue "Funnell refers to the compression of video content whereas Malvar is concerned with image compression. Hence, one of skilled in the art with the knowledge of Malvar, looking to decompress an image, will not have looked to Funnell to incorporate the arithmetic coding technique of into Malvar. Therefore, Malvar teaches away from combining with Funnell."

As to the above argument [f], examiner respectfully disagrees with the applicant, because, as best understood by examiner, Arithmetic coding, is entropy coder widely used in image compression community. Specifically , the arithmetic coding is a form of variable-length entropy encoding used in lossless data compression(see for example, Arithmetic coding - Wikipedia, the free encyclopedia at http://en.wikipedia.org/wiki/Arithmetic_coding). Since arithmetic coding technique is widely used in image compression process to compress both video image data as well as non video image data. Thus the combination of Malvar and Funnell is appropriate.

g)   At page 14 lines 16-25, claim 26, the applicant argue ", Applicant claims "decoding the compressed data" in claim 26. Funnell discloses "recompressing" video data and decoding encoded data. Applicant respectfully submits that "recompressing" video data in Funnell cannot be properly interpreted as being equivalent to "decoding the compressed data…".

As to the above argument [g], examiner respectfully disagrees with the applicant, as discussed above in section [f], the arithmetic coding is a form of variable-length entropy encoding. Funnell discloses variable length encoding 444,446 and 448 in the Entropy Compression unit 415. Thus, the variable length encoding unit of Funnell decodes the compressed data (see Fig. 4).

i)   At page 15 lines 22-28, claim 1, the applicant argues that "transforming the image data into a bit plane of first and second values." As per above, neither Anastassiou nor Malvar disclose this claims element. Furthermore, because Lee discloses extracting multiple bit planes and not a bit plane with a first and second value, applicant respectfully submits that Lee does not disclose "transforming the image data into a bit plane of first and second values"

As to the above argument [i], examiner respectfully disagrees, because as discussed in section [b] above, Anastassiou teaches "transforming the image data into a bit plane of first and second values".

J)   At page 16 lines 10-15, claims 3, 8, 12, 46, and 50, the applicant argue "Funnell is silent as to whether the bit plane is transformed into a bit plane of a first and second value. Thus, none of Anastassiou, Malvar, and Funnell can be properly interpreted as disclosing the claimed

element. Therefore, applicant respectfully submits that claims 3, 8, 12, 46, and 50 which depend on claims 1 and 20 are not rendered obvious by the combination of Anastassiou, Malvar, and Lee"

As to the above argument [J], examiner respectfully disagrees, because as discussed in section [b] above, Anastassiou teaches "transforming the image data into a bit plane of first and second values". Thus, claims 3, 8, 12, 46, and 50 which depend on claims 1 and 20 are rendered obvious by the combination of Anastassiou, Malvar, and Lee.

k)   At page 16 lines 21-27, claims 32, 41-45, the applicant argues that neither Malvar nor Funnell disclose this claimed element: "decoding the compressed data". Because Anastassiou discloses decoding a first bit plane of an image and not compressed data as claimed, Anastassiou does not disclose the claimed element. Thus, none of Anastassiou, Malvar, and Funnell can be properly interpreted as disclosing the claimed element. Therefore, applicant respectfully submits that claims 41-45 that depend on claim 32 are not rendered obvious by the combination of Anastassiou, Malvar, and Lee.

As the above argument [k], the examiner respectfully disagrees with the applicant, because as discussed in section [g] above Funnell disclosed the claim limitation "decoding the compressed data". Thus Funnell properly interpreted as disclosing the claimed element, and the combination of Anastassiou, Malvar and Funnell are proper.

Claim Rejections - 35 USC § 103

The following is a quotation of the 35 U.S.C. 103(a) which forms the basis for all obviousness

rejections set forth in this Office action:

> (a) A patent may not be obtained thought the invention is not identically disclosed or described as set forth in section 102 of this title, if the difference between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

9.   *Claims 1,4-6,13, 20-25, and 52-53 are rejected under 35 U.S.C 103 as being*

unpatentable over Anastassiou; Dimitris(hereafter Anastassiou), US Patent No. 4,546,385 A,

published in Oct. 8, 1985, in view of Malvar Henrique S. (hereafter Malvar), US patent No.

6771828 B1, filed on March 3, 2000.

As to claim 1, Anastassiou teaches A method for compressing image data of an image

(Abstract: data compression apparatus and method), comprising:

transforming the image data into a bit plane of first and second values **(Abstract, Fig. 1,**

claim 1, the data compression apparatus and method disclosed separates the graphics

image into at <u>least first and second bit planes respectively</u> containing a most significant

bit and at least significant bit for each pixel in the image indicating whether the pixel has

an extreme intensity value or one of two intermediate intensity values) using a data

transformation module **(Fig.2)**;

comparing each image element with a previous image element and if they are equal,

recording a first value into a bit plane, and if they are not equal, recording a second value into

the bit plane**(Figs. 2,3, claims 1 and 4, <u>comparing the bits in the first and second bit</u>**

<u>planes for each of the edge pixels to determine the binary state of each of the binary bits</u>

generated, for indicating by the state whether each edge pixel has an extreme intensity

value or an intermediate intensity value; and replacing said second bit plane with the indicative binary bits to compress the image data. The compressed image data is stored in the compressed image buffer storage unit 30. The comparing step is accomplished by performing a logical exclusive OR (XOR), and the out put of the XOR corresponds to the first and second value) using encoder **(Fig.2 element 30).**

However, it is noticed that Anastassiou does not specifically teach encoding repeating first and second values in the bit plane into bit plane index; wherein the compressed image is able to be decompressed using the bit plane index and the bit plane.

On the other hand the System and method for progessively transform coding digital data of Malvar teaches encoding repeating first and second values in the bit plane into a bit plane index **(Fig. 11, col. 13 lines50-60, general operation of the lossless adaptive coefficient encoder of FIG. 3A, which separates the coefficients into <u>bit planes</u> and encodes them using an <u>adaptive run-length encoder</u>. The bit planes are read from an input buffer that contains N numbers. The number of bit planes, bmax, is computed and a significance flag vector, sflg, is set to all zeros. Encoding begins with the most significant <u>bit plane and a bit plane index</u> variable bit is set equal to bmax);**

wherein the compressed image is able to be decompressed using the bit plane index and the bit plane**(col.3 lines 37-44, the present invention also includes a method for decompressing a compressed bitstream by using adaptive run-length decoding to obtain transform coefficients from the compressed bitstream).**

It would have been obvious to one of ordinary skill in the art the time of invention was made to incorporate the system and the method for progressively transform coding digital data

of Malvar into the data compressing method for graphic image of Anastassiou, because both

Anastassiou and Malvar are directed to bit- plane based image compression (Anastassiou:

Abstract, Malvar: col. 8 lines 10-15). Therefore, that would have been obvious to one of ordinary

skill in the art the time of invention was made to incorporate the bit plane and bit plane index

encoding technique of Malvar into the bit plane image comparison and comparison method of

Anastassiou, because that would have allowed user of Anastassiou to compress images using

the progressive image compression technique of Malvar, wherein the technique is efficient,

simple, less expensive and easily implementable into existing hardware(col. lines 37-40)

At to claim 4, Malvar teaches, the transformation is a repetition coded compression

horizontal transformation, repetition coded compression vertical transformation, repetition coded

compression predict transformation, repetition coded compression adaptive transformation or a

repetition coded compression multidimensional transformation**(Abstract, col.6 lines 40-**

43system and method for compressing image data using a lapped biorthogonal

transform (LBT) that includes, one DCT transformation (horizontal or vertical

transformation) **and two dimensions DCT transformation(** orthogonal transformation**),**

Lossless Adaptive Encoding) or repetition coded compression predict transformation

Regarding claim 5, all claimed limitation are set forth and rejected as per discussion for

claim 1.

As to claim 6, Anastassiou teaches the first value is a 1, and the second value is a

0**(Figs. 1 and 3, claim 4: the comparing step is accomplished by performing a logical**

**exclusive OR (XOR), and the out put of the XOR which is 1 or 0 corresponds to the first
and second value).**

As to claim 13, Anastassiou teaches a single mathematical operation is performed for
each image element (**col. 5 lines 20, the logic equation E= (c XOR f) or (x XOR p) used in
image comparison process).**

As to claim 20, Malvar teaches a data rearranging module to rearrange the transformed
image data by causing elements of the image data to be repetitive (**Fig. 11 element 1165, the
decision block 1165, encoding begins with the most significant bit plane and a bit plane
index variable <u>bit is set equal to bmax</u>, and the process is repeated until <u>bit is equal to
zero).</u>**

Regarding the remaining section of claim 20, all claimed limitation are set forth and
rejected as per discussion for claim 1.

As to claim 21, Anastassiou teaches the number of elements repeated is dependant
upon a predetermined level of image quality selected for the compressed image (**Abstract,
At low resolution, bilevel images have poor quality at edges and a quality improvement is
needed. Anastassiou specifically teaches a method separates the graphics image into at
least first and second bit planes identifies edge pixels from the first bit plane indicating a
black/white change, locates the edge pixels and generates at least a single bit for each
edge pixel indicating whether the edge pixel has a maximum intensity value such as
black or white or an intermediate gray intensity value).**

As to claim 22, Malvar teaches a source coder to receive the rearranged data as input(**Fig. 2 element 232 and 214, the adaptive entropy coding unit receives as an input the out put of coefficient reordering and blocking unit, wherein the out put of coefficient reordering unit is derived from the hierarchal lapped bi-orthogonal transformation of the input data.** The source coder corresponds to **adaptive entropy coding unit).**

As to claim 23, Malvar teaches the source coder comprises an arithmetic coder preceded by a run length encoder(**Fig. 2, 214, the adaptive entropy coding 214 includes arithmetic coder since the two of the most common entropy encoding techniques are Huffman coding and** <u>**arithmetic coding**</u>. **Further Malvar teaches method of reordered coefficients wherein the reordered coefficients are encoded using an adaptive run-length Rice-Golomb encoder. And the out put of the reordered coefficients are the input of the adaptive entropy encoder that include the arithmetic coding).**

As to claim 24, Malvar teaches a camera for capturing at least one image (**col.17 lines 65, the present invention includes a digital cameras)** and for supplying digital data to the data transforming module (**col.8 lines 50-51, the digital camera with adjustable memory management model capture the picture. The captured picture is inputted to the encoder (see Fig. 3)**; a reshaping block for rearranging the digital data into a matrix of image data values (**Fig. 13 element 1312, input matrix Q containing MXN quantized HLT coefficients is read. The first reordering occurs according to the matrix shown in FIG. 9, where, in this working example, N=8)**; a processor for receiving the matrix of image data values and compressing the image data values to form compressed data (**Figs.3 and 4 shows the process of compressing the input data)**; and a memory for storing the compressed data (**Fig.**

7 element write buffer x containing hierarchical LBT coefficients to out put, wherein the hierarchical LBT is used to compress image data) .

As to claim 25, Malvar teaches the camera is analog, and the system further comprising an analog-to-digital converter to convert the analog image into digital data **(Fig. 1, col.17 lines 65, the present invention includes a digital cameras. It is known that a digital camera has an analog to digital AD converter in its structure see for instant US Patent 4,502775 of Kuroki published in 1985).**

As to claim 52, Malvar teaches the predetermined level of image quality is user defined(**col. 5 lines 45-48, A user may enter commands and information into the personal computer 100 through input devices such as a keyboard 140 and pointing device 142**).

As to claim 53, Malvar teaches the method is used for an application selected from the group consisting of: medical image archiving, medical image transmission, database system, information technology, entertainment , communications applications, and wireless application, satellite imaging, remote sensing, and military applications(**col.17 lines 30-35, real world application: FIG. 14 is a simplified block diagram illustrating a real world implementation of the encoder of FIGS. 3A-3B and the decoder of FIGS. 4A-4B in a software application environment 1410 that handles image data. In particular, the software application environment 1410 includes a plurality of high-level application environments 1420 such as e-mail, word processing, spreadsheet, internet browser presentation and other types of applications).**

10.   *Claims 26-40 are rejected under 35 U.S.C 103 as being unpatentable over Malvar;*

Henrique S. (hereafter Malvar), US patent No. 6771828 B1, filed on March 3, 2000, in view of

Funnell et al.(hereafter Funnell), US Patent application No. 20040136457, published Jul. 15,

2004.

        As to claim 26, *Malvar teaches* A method for decompressing compressed data **(Figs.4A**

and 4B, col. 3 lines 38-42, the present invention also includes a method for

decompressing a compressed bitstream) comprising:

        run-length decoding the compressed data**(Figs.4A and 4B,col. 3 lines 38-42, the**

method for decompressing a compressed bitstream by using adaptive run-length

decoding to obtain transform coefficients from the compressed bitstream);

        reverse transforming the decoded data **(Fig. 4B inverse DCT Transformation**); and

        rearranging the transformed decoded data into a lossless decompressed form

compression**(Fig. 4B element 452, In this embodiment 450, the procedures performed by**

the inverse coefficient reordering processor 420 and the inverse coefficient reordering

processor 442).

        However it is noted that Malvar does not specifically teach "arithmetically decoding the

compressed data", **although Malvar suggests the use of arithmetic encoding in the wavelet**

based compression environment. Further, Malvar teaches encoding and decoding

process that includes adaptive entropy encoding (col.7 lines 6-8). It is known that the two

of the most common entropy encoding techniques are Huffman coding and arithmetic

coding. Thus, Malvar teaches arithmetic coding, and inherently teaches arithmetically

decoder, since Malvar disclosed both encoding and decoding process.

On the other hand the Method and system for supercompression of compressed digital video of Funnell specifically teaches arithmetically decoding the compressed data **(Abstract, [0089], arithmetic decoding is performed in a step 1315, using a standard arithmetic decoding process).**

It would have been obvious to one of ordinary skill in the art the time of invention was made to incorporate the well known arithmetic decoding technique taught by Funnell in to the system and method for progressively transform coding digital image data of *Malvar,* because both Funnell and Malvar are directed to digital image compression and decompression (Malvar: Abstract, Figs. 3 and 4, Funnell: Abstract), further both Funnell and Malvar implement DCT based compression and IDCT based decompression technique.

It would have been obvious to one of ordinary skill in the art the time of invention was made to incorporate the arithmetic coding technique of Funnell into Malvar, because that would have allowed user of Malvar to recompress previously compressed data (convert back to the original format)with little or no loss.

As to claim 27, Malvar teaches the reverse transformation is one dimensional including a horizontal variant, a vertical variant, or a predict variant(**col.6 lines 40-43, <u>one-dimensional</u> and two-dimensional DCTs are implemented in image compression process. Thus, one-dimensional and <u>two-dimensional </u>inverse DCTs (IDCts) are implemented in the decompression process).**

As to claim 28, Malvar teaches the reverse transformation is two dimensional such as a multidimensional variant (**col.6 lines 40-43, one-dimensional and <u>two-dimensional</u> DCTs are**

implemented in image compression process. Thus, one-dimensional and two-

dimensional inverse DCTs (IDCts) are implemented in the decompression process).

As to claims 29 and 35, Malvar teaches the rearrangement of the transformed decoded

data comprises a reversible sort process (**Fig. 4 element 410, lossless adaptive decoder**

which is a reversible process) and a last to first rearrangement (**Fig. 4 element 452, the**

inverse combined coefficient rearranging unit).

As to claim 30, Malvar teaches the compressed data is image (**Abstract, col. 4 lines**

35-38, a system and method for compressing image data using a lapped biorthogonal

transform (LBT)).

As to claim 31, Malvar teaches the image data originates from a photo, drawing or video

frame (**col. 17 lines 44-47, the video input/output function 1440 provides the ability to**

display and receive video and image data from external sources. Fig 3A shows pictures

as input data).

Regarding claims 32-34, 36 and 37, all claimed limitation are set forth and rejected as

per discussion for claims 26-28, 30 and 31 respectively.

As to claim 38, Malvar teaches a portion of the image data is compressed lossless while

the remaining portion of the image data is compressed lossy (**col. 4 lines 24-26, Malvar**

teaches both lossless and lossy compression. FIG. 11 is a working example represented

by a flow chart showing the general operation of the lossless adaptive coefficient

encoder of FIG. 3A, and in the absence of quantization (which introduces lossy effects) the input data is recovered exactly by the inverse transform(col.11 lines 25-27))

As to claim 39, Malvar teaches rearranged data is passed to an input of a source coder **(Fig. 2 element 232 and 214, the adaptive entropy encoding unit receives as an input the out put of coefficient reordering and blocking unit).**

As to claim 40, Malvar teaches the source coder comprises an arithmetic coder preceded by a run length encoder(**Fig. 2, 214, the adaptive entropy coding 214 includes arithmetic coder since the two of the most common entropy encoding techniques are Huffman coding and arithmetic coding. The reordered coefficients are encoded using an adaptive run-length Rice-Golomb encoder, and the out put of the reordered coefficients are the input of the adaptive entropy encoder).**

11.   *Claims 2, 14-19 are rejected under 35 U.S.C 103 as being unpatentable over Anastassiou; Dimitris (hereafter Anastassiou), US Patent No. 4,546,385 A, published in Oct. 8, 1985, in view of Malvar Henrique S. (hereafter Malvar), US patent No. 6771828 B1, filed on March 3, 2000, further in view of Lee et al., (hereafter Lee), US Patent No.6535244 B1, published on Mar. 18, 2003.*

As to claim 2, Anastassiou teaches comparing each image element with a previous image element **(Figs. 2, 3, claims 1 and 4, comparing the bits in the first and second bit planes for each of the edge pixels);**

However, it is noted that both Anastassiou and Malvar do not teach "comparing each image element with a previous image element and if they are within a predetermined range of each other, modifying the image element to be equal to the previous image element; where repetition is increased to enable lossy compression of the image"

On the other hand the image stabilizing apparatus using bit-plane matching of Lee teaches comparing each image element with a previous image element and if they are within a predetermined range of each other, modifying the image element to be equal to the previous image element; where repetition is increased to enable lossy compression of the image(**col. 2 lines 32-40, Lee specifically teaches steps of: extracting bit-planes from digital image information; selecting an optimum bit -plane among the extracted bit-planes; storing the optimum bit planes of a previous screen and a current screen; <u>comparing pixel values of the optimum bit-plane of a previous screen stored in the bit-plane memory and pixel values of the optimum bit-plane in a current screen to calculate correlation values between the pixels bit-planes</u>, and accumulating the calculated correlation values.** The predetermined range **corresponds to the predetermined threshold value that utilized to maintain or replace bit plane (col. 5 lines 20-25)).**

It would have been obvious to one of ordinary skill in the art the time of invention was made to incorporate Image stabilizing apparatus using bit-plane matching of Lee into the combined method of Anastassiou and Malvar, because all Anastassiou, Malvar and Lee are directed to bit- plane based image compression(Abstract).

Therefore, that would have been obvious to one of ordinary skill in the art the time of invention was made to incorporate the optimal bit plane and bit plane index encoding detection

technique of Lee (Lee: col. 5 lines 5-10) into the combined method of Anastassiou and Malvar,

because that would have allowed user of Anastassiou to obtain optimal bit plane using the

optimal bit plane detector 202 of Lee (Lee: col. 5 lines 20-25).

As to claim 14, Lee teaches for the repetition coded compression predict transformation,

a mapping value is used to replace repeating image elements (**Fig. 4, col. 5 lines22-32, Lee**

specifically teaches calculates an amount of movement of input image information

between two screens by using bit-plane matching. If the absolute value difference

between the selected bit plane conversion rate and the average bit plane conversion rate

is equal to or less than the threshold value T, then the current <u>bit-plane is maintained</u>.

However, if the absolute value is greater than the threshold value T in the step 44, the <u>bit-</u>

<u>plane is changed into another one).</u>

As to claim 15, Lee teaches for the mapping value is a value that does not exist in the bit

plane (**Fig. 4, col. 5 lines22-32, if the absolute value difference between the selected bit**

plane conversion rate and the average bit plane conversion rate is greater than the

threshold value T in the step, the <u>bit-plane is changed into another one).</u>

As to claim 16, Lee teaches the mapping value is a value that exists in the bit plane(**Fig.**

4, col. 5 lines22-32, If the absolute value difference between the selected bit plane

conversion rate and the average bit plane conversion rate is equal to or less than the

threshold value T, then the current <u>bit-plane is maintained</u>).

Regarding claim 17, all claimed limitation are set forth and rejected as per discussion for claims 14 and 15.

Regarding claim 18, all claimed limitation are set forth and rejected as per discussion for claims 14 and 16.

Regarding claim 19, all claimed limitation are set forth and rejected as per discussion for claims 14 and 15.

12. *Claims 3, 8, 12, 46 and 50 are rejected under 35 U.S.C 103 as being unpatentable over Anastassiou; Dimitris (hereafter Anastassiou), US Patent No. 4,546,385 A, published in Oct. 8, 1985, in view of Henrique S. (hereafter Malvar), US patent No. 6771828 B1, filed on March 3, 2000, further in view of Funnell et al. (hereafter Funnell), US Patent application No. 20040136457, published Jul. 15, 2004.*

As to claim 3, Anastassiou teaches the comparison of the image elements **(Abstract, Fig.1)**;

However it is noted that both Anastassiou and Malvar doe not specifically teach "the comparison of the image elements is performed in raster order, from left to right and then top to bottom" **although Anastassiou suggests a raster scan order wherein an edge bit can be generated for each edge pixel and stored for transmitted with the first bit plane data to indicate for <u>each pixel in raster scan order</u> (col. 4 lines65-67).**

On the other hand the Method and system for supercompression of compressed digital video of Funnell teaches the comparison of the image elements is performed in raster order, from left to right and then top to bottom(**[0092], the encoder iterates over event matrix as the values would be read (i.e., raster iteration or left-to-right and top-to-bottom**).

It would have been obvious to one of ordinary skill in the art the time of invention was made to incorporate the raster scanning taught by Funnell into the combined method of Anastassiou and Malvar, because all Anastassiou, Malvar and Funnell are directed to digital image compression and decompression (Anastassiou: Abstract, Malvar: Abstract, Figs. 3 and 4, Funnell: Abstract), further all Anastassiou, Malvar and Funnell implement the concept of bit plane in their image compression process, further more both Funnell and Malvar implement DCT based compression and IDCT decompression technique.

It would have been obvious to one of ordinary skill in the art the time of invention was made to incorporate the arithmetic coding technique of Funnell into the combined method of Anastassiou and Malvar, because that would have allowed user of Anastassiou to recompress previously compressed data (convert back to the original format) with little or no loss.

As to claims 8 and 46, Malvar teaches the repetition coded compression multidimensional transformation, comparison is in both horizontal and vertical directions (**using a lapped biorthogonal transform (LBT) that includes, one and two dimensions DCT transformation (col.6 lines 40-43)**), and a separate bit plane is used for each direction (**Fig. 11, col. 13 lines 53-56, the <u>bit planes are read from an input buffer x</u> (box 1110) that contains N numbers**).

As to claims 12 and 50, Funnell teaches storage in bit planes is in a matrix **([0095],**

Funnell specifically teaches information in a p-frame can be structured into several

planes (i.e., "event <u>matrices</u>") with different levels of detail. A basic A **basic event matrix.**

It is a two-dimensional bitmap where the two-dimensional bitmaps are 1-bit planes

([0095])

13.   Claims 41-45 are rejected under 35 U.S.C 103 as being unpatentable over Malvar;

Henrique S. (hereafter Malvar), US patent No. 6771828 B1, filed on March 3, 2000, in view of

Funnell et al. (hereafter Funnell), US Patent application No. 20040136457, published Jul. 15,

2004, further in view of Anastassiou; Dimitris (hereafter Anastassiou), US Patent No. 4,546,385

A, published in Oct. 8, 1985.

As to claim 41, however it is noted that both Malvar and Funnell do not specifically teach

additional compression of the rearranged image data wherein each element is compared with a

previous element and: (c) if they are equal, a first value is recorded; and (d) if they are not

equal, a second value is recorded.

On the other hand the data compression method for graphics images of *Anastassiou*

teaches additional compression of the rearranged image data wherein each element is

compared with a previous element and: (c) if they are equal, a first value is recorded; and (d) if

they are not equal, a second value is recorded(**Figs. 2,3, claims 1 and 4, comparing the bits**

in the first and second bit planes for each of the edge pixels to determine the binary state

of each of the binary bits generated, for indicating by the state whether each edge pixel

has an extreme intensity value or an intermediate intensity value; and replacing said

second bit plane with the indicative binary bits to compress the image data. The

compressed image data is stored in the compressed image buffer storage unit 30. The

comparing step is accomplished by performing a logical exclusive OR on a most

significant bit and a least significant bit of the intensity value of each of the edge pixels).

It would have been obvious to one of ordinary skill in the art the time of invention was

made to incorporate the technique of comparing bits in a first and second bit-plane for each

pixels in an image of *Anastassiou (claim 1) in to the combined method of* Malvar and Funnell,

because all Malvar, Funnell and *Anastassiou are directed to image compression. Therefore,*

that would have been obvious to one of ordinary skill in the art the time of invention was made

to incorporate the image a bit- plane based image comparison technique of *Anastassiou in to*

the combined method of Malvar and Funnell, because that would have allowed user of Malvar to

enhance both quality and compressibility of the compressed image (*Anastassiou*: Abstract)

As to claim 42, Anastassiou teaches each element is a pixel(**Regarding claim 42, all**

claimed limitation are set forth and rejected as per discussion for claim 41).

As to claim 43, Anastassiou teaches the first value is a 1, and the second value is a

0(**Figs. 1 and 3, claim 4: the logic operation XOR).**

As to claim 44, Anastassiou teaches the first and second values are stored in a bit

plane(**Regarding claim 44, all claimed limitation are set forth and rejected as per**

discussion for claim 41).

As to claim 45, Anastassiou teaches a one-dimensional compression, a single bit plane is used to store the values (**col. 2 lines 55-60, identifying edge pixels from an encoding or decoding of the first bit plane of the image**).

As to claim 51, Anastassiou teaches a single mathematical operation is performed for each image element (**col. 5 lines 20, the logic equation E= (c XOR f) or (x XOR p) used in image comparison process**).

14.   *Claims 7, 9,10,11,47, 48 and 49 are rejected under 35 U.S.C 103 as being unpatentable over Anastassiou; Dimitris(hereafter Anastassiou), US Patent No. 4,546,385 A, published in Oct. 8, 1985, in view of Henrique S. (hereafter Malvar), US patent No. 6771828 B1, filed on March 3, 2000, further in view of in view of Funnell et al.(hereafter Funnell), US Patent application No. 20040136457, published Jul. 15, 2004, further in view of Saiga et al., (hereafter Saiga), US Patent No. US 7031531 B1, filed on Aug. 14, 2000.*

As to claim7, Malvar and Funnell teach for the repetition coded compression horizontal transformation, repetition coded compression vertical transformation, repetition coded compression predicts transformation (**these limitations are discussed in claim 4 above**):

However, it is noted that Anastassiou, Malvar and Funnell do not specifically teach "single bit plane is used to store the values" although Anastassiou, Malvar and Funnell suggests multiple bit plane;

On the other hand the Image encoding device and method therefor of Salga teaches single bit plane is used to store the values(**Abstract: an image preprocessor (305)**

connected to the bit plane generator (303) to arrange bit data of the same position

forming a plurality of bit planes in close proximity to combine into a single bit plane).

It would have been obvious to one of ordinary skill in the art the time of invention was made to incorporate the technique of combining a plurality of bit planes in to a single bit plane using the bit plane generator (303) taught by Salga into the combined method of Anastassiou, Malvar and Funnell, because all are directed to a bit- plane based image compression.

It would have been obvious to one of ordinary skill in the art the time of invention was made to incorporate the bit planes merging technique of Salga into the combined method of Anastassiou, Malvar and Funnell, because that would have allowed user of Anastassiou, to obtain a higher compression rate using a hardware or software module that performs currently-available image compression processing (**Salga: Abstract**)

As to claims 9 and 47, Salga teaches the bit-planes for the horizontal and vertical directions are combined by binary addition to form a repetition coded compression bit-plane (**Abstract, col.3 lines 5-8, Salga is directed to binary image compression, thus the process of combining a plurality of bit planes into a single bit plane is carried out using binary addition).**

As to claims 10 and 48, Salga and Malvar teaches the combining is by binary addition (**see the discussion of claim 6 above**) only the second values being stored for lossless reconstruction of the image (**Fig. 4, Malvar teaches lossless reconstruction storing only one value is a design choice).**

Regarding claims 11 and 49 all claimed limitation are set forth and rejected as per

discussion for claims 4 and 7.

Contact information

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AHMED SAMIR can be reached on (571)272-7413. The fax phone number for the organization

where the application or proceeding is assigned is 571-237-8300. Information regarding the

status of an application may be obtained from the patent Application Information Retrieval

(PAIR) system. Status information for published application may be obtained from either Private

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